

## **Mortality Assessment Technology (MAT) Life Insurance / Due Diligence**

Change is a constant in today's business environment. The landscape in which today's life insurance industry operates is unsettled and complex. Escalating competition, capital constraints and rising customer expectations combine increasingly to squeeze profitability. To remain competitive, carriers need new, cost-effective solutions.

BioSignia, a privately-held company, has developed a break-through technology that significantly improves mortality predictions. Mortality Assessment Technology (MAT) is a potential game changer to the fundamental way direct writers and reinsurers do business. With the help of PPI Consulting, this due diligence report will show why we believe MAT will fundamentally alter the way insurers assess and respond to risk. The natural focus is **standard rating and better** life and similar products with face amounts in excess of \$200,000 and ranging up to mid-seven figures.

BioSignia's core capability – Synthesis Analysis™ – is a patented statistical methodology that combines input data drawn from multiple sources into individual predictive calculations. Synthesis Analysis™ provides the underpinnings of Mortality Assessment Technology™ (MAT), as well as BioSignia's other applied technologies. BioSignia's key personnel are well-respected within the scientific community and have extensive experience in medicine, epidemiology and applied mathematics. The company has several academic partners including Duke University, Cornell University and the University of Washington.

Like many early-stage companies, BioSignia has focused inwardly on technological innovation. Because MAT is now ready for commercialization, with the help of a consulting firm, its board of directors has recently brought in a new management team charged with bringing this game-changing application to market. BioSignia is currently seeking life insurance companies interested in the concept; of course, they are willing to support trial-implementations in anticipation of a full-scale roll out.



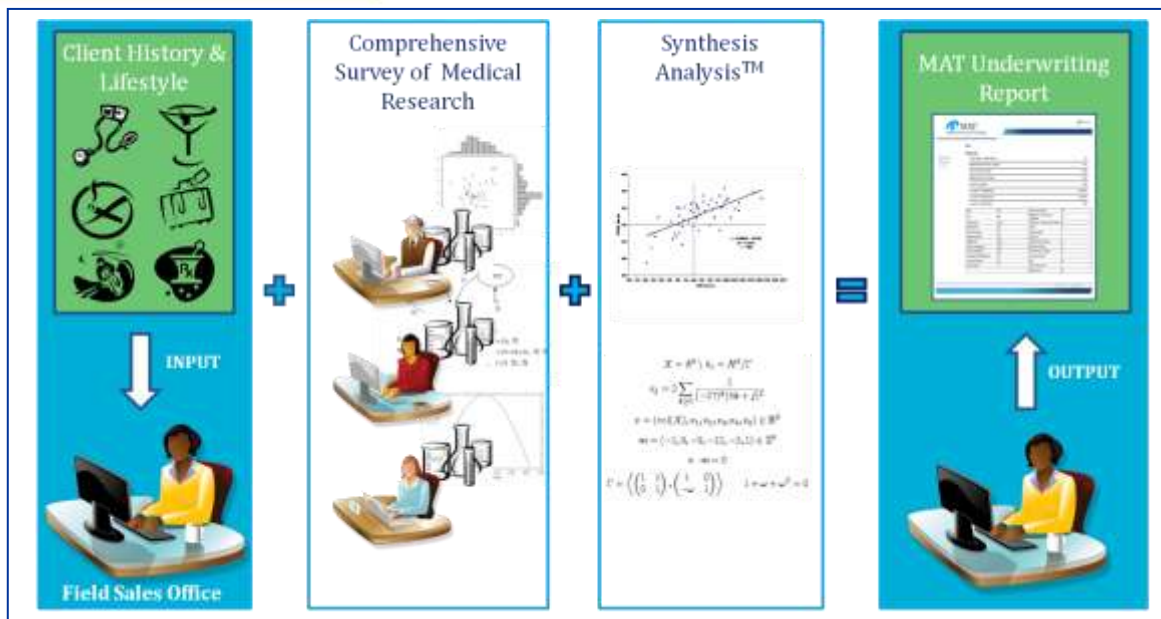
## **Mortality Assessment Technology™ (MAT)**

Viewed at the highest level of abstraction, MAT is a mathematical model of human longevity. Using the computational power of Synthesis Analysis™, MAT evaluates the combined impact a complex interplay of **medical and lifestyle factors** is likely to have on a unique individual's total life expectancy. It uses data **typically gathered in the life insurance application** process. The science behind this evaluation is a mathematical algorithm that abstracts key statistics from relevant research studies, calculates the relative impact of multiple variables, and applies the resulting knowledge to individuals on a case-by-case basis. Unlike conventional underwriting techniques, MAT's risk assessment is **both holistic and specific** to each person. This higher level of granularity results in significantly greater predictive accuracy.

MAT is not a "software application" that is "sold" and "installed" in the conventional sense of those words. Rather, it is a "technological capability" (Software as a Service or **SaaS**) that permanently resides on secure servers; it is an "electronic underwriting tool" that client carriers may access via the internet on an "as needed - pay per use" basis. Initial set up is limited to establishing an electronic interface and tailoring the input and output to a company's specifications. MAT can then generate classification results as soon as the carrier transmits complete applicant information.

BioSignia has set \$25.00 per policy (or per click) as the starting point for discussion. The ultimate price points will, of course, be dictated by the marketplace.

BioSignia's throughput capacity is virtually unlimited. Importantly, because new research data are continuously incorporated into the algorithms, clients automatically reap the benefits of updates – immediately and at no cost made through BioSignia's Synthesis Analysis™. The diagram below provides a schematic representation of MAT's functionality.



In summary, MAT is a statistical web-service methodology that combines all underwriting variables into a single mortality equation. BioSignia's innovative technology:

- Incorporates and **continuously updates** all relevant medical studies
- Evaluates each applicant's risk uniquely and as a totality
- Uses data normally found on the **insurance application**
- **Accepts and transmits data, easily and electronically**, via the internet
- Requires only **minimal installation** and training (SaaS technology)
- Offers clients the **flexibility** to tailor underwriting criteria
- Generates full underwriting results on a timely basis
- Delivers assessments independently of Attending Physicians' Reports
  - It may prove that for Standard issuances and better, the APS with its attendant expense, is superfluous
- Is quicker and less expensive than conventional underwriting
- Data entry is **manual or electronic**
  - Trials have shown that data-entry time ranges from three to five minutes per case in manual-entry situations
  - Electronic submissions are virtually instantaneous
- Data entry format is **similar to e-applications**
- Data entry features **rules engine easily customized** for each client
- All data are returned to the carrier or reinsurer in ACORD 1125 format

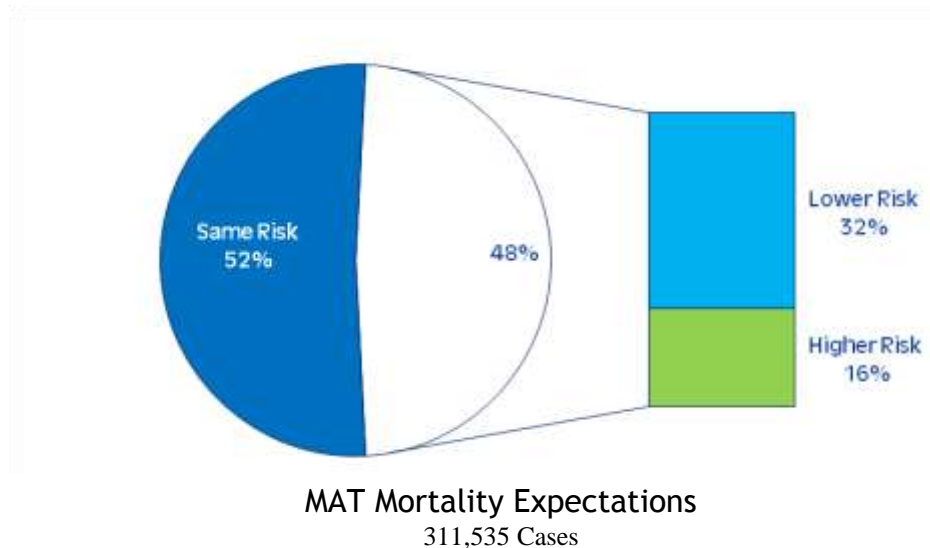
MAT has conclusively demonstrated, in a number of peer-reviewed validations, its ability to produce mortality expectations that are substantially more accurate than traditional underwriting methods; it has the potential to change the face of the direct life insurance and reinsurance businesses.

## Technology Validation

MAT is premised on a simple but powerful logic model: Long-term profitability is closely correlated with a life insurer or reinsurer's ability to **accurately quantify and differentiate the risk** inherent in a given portfolio of policies. Therefore, a marked improvement in precision at the individual -policy level should substantially increase overall predictive accuracy and, thus, enhance profitability.

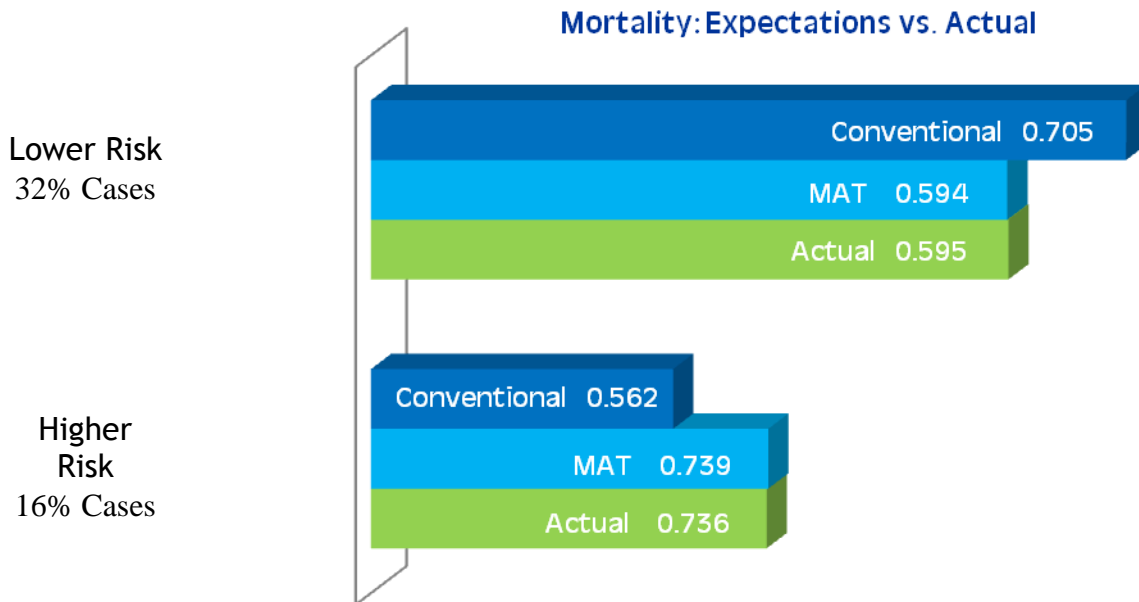
BioSignia recognizes that MAT's credibility in the marketplace is predicated on offering clear, unassailable proof of its technological edge. During the past few years, its scientific team has committed considerable time and effort to validating MAT's capabilities. We have every reason to believe any further test will confirm these initial findings.

To test MAT's accuracy, BioSignia conducted (among others) a retrospective study of 311,535 actual life insurance cases; the **study includes a statistically significant number of deaths**. MAT first assessed the risk of each policy and then compared its evaluations to the prior mortality expectations. As shown in the chart below, MAT's classifications differed from those of the original underwriters in almost half the cases.



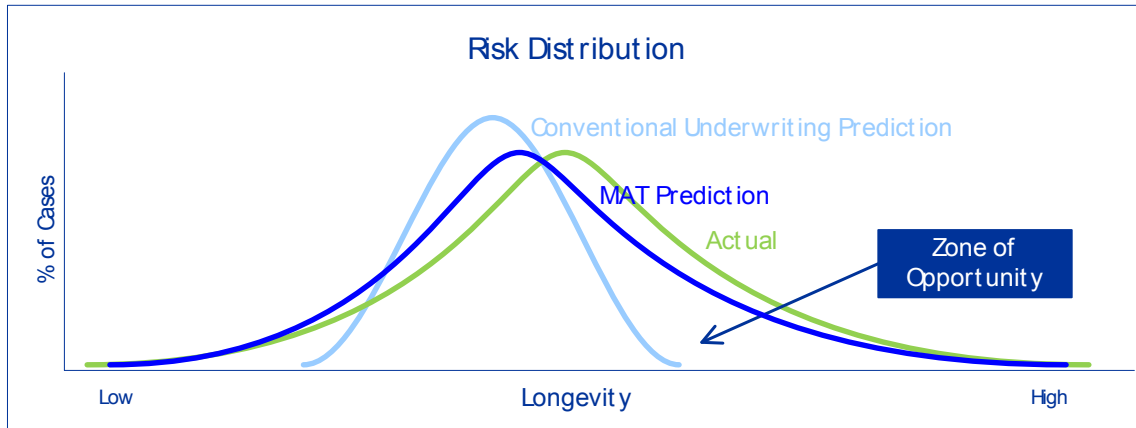
The risk assessments generated by the two methods were then compared with actual mortality experience. For the 52% of cases in which the techniques were in agreement on policy classification, both were not only equally accurate but also relatively close to actual mortality. However, for the 48% of cases in which the two assessments were substantively different, MAT was significantly more accurate. More importantly, as illustrated in the graph below, **MAT's predictions almost precisely matched actual experience**.

Same Risk Assessment	
52% Cases	
Conventional Expectation	0.588
MAT Expectation	0.584
Actual Mortality	0.633



When taken together, these results support the following working hypothesis which could be validated by additional tests: conventional underwriting falls short when compared to actual mortality in a substantial proportion of cases thus there is room for major improvement. Because **errors of pessimism exceed errors of optimism by a factor of 2:1**, insurers tend to be overly conservative and, thereby, miss important opportunities to increase profitability that a more realistic risk assessment would yield. MAT could solve this problem. As we discussed, this technology could have a **significant positive impact** when used to audit books of business or in the process of **due diligence and pricing**.

We believe a larger force may underlie MAT's ability to predict mortality more accurately than conventional methods. If this assumption is correct, we can expect to see the same general patterns found in the preliminary sampling emerge in all future validation tests. The chart below (for illustrative purposes only) is a schematic representation of the concepts we will describe here.



Recent studies of the human mind have demonstrated that, when making predictions, all people – including expert analysts – consistently underestimate the likely range of outcomes. That is, expectations tend to fall within a tall, narrow bell curve that misses the possible, if less likely, outliers at both ends of distribution. This finding holds true for all types of probability assessments, and remains true even when a person’s pessimistic or optimistic biases are factored in. Simply put, the human brain is not engineered to envision extreme possibilities. One need only consider the current economic crisis to understand that events previously considered “impossible” can, in fact, occur. In the life insurance world, this **natural tendency to define risk too narrowly** is exacerbated by fact that underwriting has generally not kept pace with the progress the medical community and other factors have made in increasing average life expectancy. People today are living longer, healthier lives than ever before. And this trend can only be expected to accelerate. Underwriting needs to catch up.

Taken together, these factors suggest that, when compared to actual experience, traditional underwriting will not only misjudge the full width of the risk distribution curve but also err far more frequently at the high (longer lifespan) end of that curve. MAT overcomes the problems inherent in conventional underwriting methods. First, because it subjects an applicant’s data to purely mathematical analysis, the human element is removed from the equation. Second, because assessments are based on up-to-the-minute research, predictions take medical progress and changes in lifestyle fully into account. As a result, we should expect MAT’s risk distribution curve to more accurately mirror actual mortality. That is, relative to traditional analysis, both curves should be shallower and wider, with peaks shifted to right.

If this theory is correct, reliable and quantifiable predictions at the high end of the distribution curve have significant implications for users of MAT. For example, direct writers who had previously underestimated the real improvement in predicted mortality would have several pricing options. The first option -- no change in pricing -- would allow for **increased profitability**. Alternatively, they might elect to reduce pricing levels in order to potentially **increase market share**. At the low (high risk) end of the distribution curve, carriers would have opportunities to reduce the cost of policies without taking on excessive risk. In all cases, pricing would ultimately reflect the marketplace. However, MAT should give insurers and reinsurers the confidence to act on opportunities to make relatively low risk adjustments in sales strategies.